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the same time. The space of about six miles in depth, within which this increase of density could take place according to known laws of barometric pressure, would not subtend to our eye so much as $\frac{1}{3 \cdot \frac{1}{10}}$ th of a second, a quantity not to be regarded in an estimate where so much latitude has been allowed for errors.

In concluding this paper, Dr. Wollaston remarks, that although in reference to a solar atmosphere some doubt may be entertained in consequence of peculiar effects of heat, no such error can be suspected in regard to Jupiter; and as that planet has not its due share of an infinitely divisible atmosphere, there seems no ground upon which the phenomenon of the earth's atmosphere can be maintained, but on the supposition of ultimate atoms of definite magnitude, no longer divisible by repulsion of their parts.

On the Expansion in a Series of the Attraction of a Spheroid. By James Ivory, M.A. F.R.S. Read January 17, 1822. [*Phil. Trans.* 1822, p. 99.]

Mr. Ivory's principal object in this paper appears to be the removal of some difficulties in the demonstration of the method of developing the attractions of spheroids in an infinite series, as employed by Laplace in the *Mécanique Céleste*. It is natural to think, he observes, that the theory of the figure of the planets would be placed on a firmer basis if it were deduced directly from the general principles of the case, than when it is made to depend on a nice and somewhat uncertain point of analysis; and he conjectures that the theory will probably be found to hinge on this proposition,—that a spheroid, whether homogeneous or heterogeneous, cannot be in equilibrium by means of a rotatory motion about an axis, and the joint effect of the attraction of its own particles and of the other bodies of the system, unless its radius be a function of three rectangular coordinates; for if this proposition were clearly and rigorously demonstrated, the analysis of Laplace, on changing the ground on which it is built, would require little or no alteration in other respects.

Without, however, attempting to demonstrate this proposition in all its extent, the author has substituted a more direct and simple mode of argument than that of Laplace, which is perfectly conclusive with respect to all the cases to which the theorem in question can possibly require to be applied. He has shown that by immediately transforming a given expression into a function of three rectangular coordinates, we obtain the same development as is deduced in the *Mécanique Céleste*, by a more general and complicated mode of reasoning, which seems to be so far objectionable, as it tends to introduce a variety of quantities into the series which do not alter its total value, since they destroy each other, but which may possibly interfere with the accuracy of its application to particular cases, in which it may be employed as a symbolical representation: for example, when any finite number of terms is assumed as affording an approximate value;

since, if the expression developed has not been reduced to the form of a function of three rectangular coordinates, the development may contain an infinite number of terms, which are introduced by the operation without being essential to its final result. He takes for the example of such a case the equation of a spheroid, prominent between the equator and the poles, somewhat resembling the figure which was once attributed to Saturn; and he shows that its development in the form required will contain an infinite number of quantities arising from the expansion of a radical, which are not to be found in the original function.

Mr. Ivory considers, in the second place, the differential equation that takes place at the surface of a spheroid, and the demonstrations which have been published by Laplace and by Poisson; and he concludes that this equation is wanted neither for proving the possibility of the development, nor for calculating its terms; but in this plainer way of considering the matter, it appears that the development does not represent the given expression, when that expression is not an explicit function of three rectangular coordinates, in the same sense that it does when it is such a function. There is, therefore, a difficulty left unexplained; and we may be permitted to doubt whether so important a part of the celestial mechanics as that regarding the figure of the planets, rests with sufficient evidence on the doctrine laid down concerning the generality of the development.

On the late Extraordinary Depression of the Barometer. By Luke Howard, Esq. F.R.S. Read January 24, 1822. [*Phil. Trans.* 1822, p. 113.]

On the evening of the 24th of December last, Mr. Howard found the barometer at his house at Tottenham Green at 28·20 inches. The wind was moderate at S.E., the temperature 45°, and water boiled freely at 210°. At 11 P.M. the barometer fell to 27·96 inches, and at 5 A.M. on the 25th to 27·82, below which the author thinks it did not descend. By 8 A.M. it again reached 28. In the twenty-four hours preceding, 0·8 inch rain had fallen, but in the twenty-four hours following there fell none, nor was the wind strong. By midnight on the 25th the quicksilver reached 28·07 inches, and remained there during the twelve hours following,—a thing very rare in our climate. The quicksilver then rose in an uninterrupted curve, and on the 31st touched upon 30 inches, with fine weather. A diagram showing the state of the barometer during the last two months of 1821, as well as the quarter of the wind and quantity of rain fallen, accompanies this paper. During these two months the rain amounted to 10·10 inches, a quantity without precedent in the same space of time at London.